IN-VITRO FEMORAL COMPONENT LOOSENING OF TKA: COMPARISON OF HIGH-FLEX AND CONVENTIONAL PS DESIGNS

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Abstract

Introduction: High-flexion (HF) TKA designs were introduced in order to achieve greater flexion than with conventional TKA designs. Although early clinical results are promising, recent literature raises concerns about fixation and risk for early loosening of the femoral component during high demanding activities. This study's aim was to measure the loosening force of the femoral component of several PS-TKA designs in a deep flexion configuration.

Methods: The loosening force of the femoral component of ten contemporary PS-TKAs, including five HF and five conventional designs from the major orthopaedic companies were evaluated. To simulate a deep flexion configuration, each TKA was implanted in a femoral bone model and placed in a loading frame in 135° of flexion, with the tibia vertically. Loosening of the femoral component was induced by raising the tibial insert with constant displacement rate, maintaining the same flexion angle. The resisting force was recorded continuously. A stereo-photogrammetric system registered the relative motion between the femoral component and the bone model. The loosening force was determined when a gap of 2 mm was observed. The influence of pegs on the loosening force was also investigated.

Results: Generally, conventional femoral designs required higher forces before loosening occurred compared to HF designs ($p<0.001$). In the group of the HF designs there was a statistically significant difference between the designs ($p=0.015$) due to the shape of the internal box cut. For some designs, the presence of pegs induced a statistically significant change in loosening force.

Discussion and Conclusion: Several design characteristics of the femoral component can alter its resistance to loosening. In this in vitro study, it was shown that the shape of the internal box cut and the presence of pegs, as well as the geometry of the pegs, are important factors for the loosening force. In the group of the HF components there was a statistically significant difference between the designs with an open and a closed box.